



**A COMMANDER'S GUIDE TO
HAZARDOUS WASTE
MINIMIZATION**

AT ARMY HEALTH CARE FACILITIES



A COMMANDER'S GUIDE TO
**HAZARDOUS WASTE
MINIMIZATION**
AT ARMY HEALTH CARE FACILITIES

FEBRUARY 1990

A COMMANDER'S GUIDE TO
HAZARDOUS WASTE
MINIMIZATION
AT ARMY HEALTH CARE **FACILITIES**



Use of trademarked names does not imply endorsement by the U.S. Army but is intended only to assist in identifying specific products.

A COMMANDER'S GUIDE TO HAZARDOUS WASTE MINIMIZATION AT ARMY HEALTH CARE FACILITIES

February 1990

PREFACE

The U.S. Army Environmental Hygiene Agency developed this guide to assist commanders in reducing the amount of hazardous waste generated at their Health Care Facilities. Any requests for additional guidance or assistance may be directed to the Waste Disposal Engineering Division at AUTOVON 584-3651 or commercial (301) 671-3651.

We thank the following organizations for helping us prepare this document:

- U.S. Army Health Services Command
- Walter Reed Army Institute of Research
- Armed Forces Institute of Pathology

We invite users of this guide to send comments and suggested improvements on DA Form 2028, Recommended Changes to Publications and Blank Forms. Mail these suggestions to Commander, U.S. Army Environmental Hygiene Agency, ATTN: HSHB-ME-S, Aberdeen Proving Ground, MD 21010-5422.

INTRODUCTION

The purpose of this guide is to provide commanders with the information they need to make sure their health care facilities have effective hazardous waste minimization programs.

WHAT IS HAZARDOUS WASTE MINIMIZATION?

Hazardous Waste Minimization, or HAZMIN, is the reduction in the volume or toxicity of hazardous waste generation and disposal to the extent proven economically feasible.

WHO GENERATES HAZARDOUS WASTE?

For regulatory purposes, the Army has interpreted the EPA's definition of "generator" to mean an installation as a whole. In most cases, health care facilities are tenant activities at installations. They must work with installation environmental offices to ensure timely and proper disposal of hazardous waste.

REASONS FOR MINIMIZING HAZARDOUS WASTE

There are several reasons to minimize hazardous waste generation. For instance, the EPA's land disposal restrictions have led to a substantial rise in hazardous waste treatment costs. Also, the EPA requires hazardous waste generators to certify that they have a HAZMIN program prior to shipment of hazardous wastes. These requirements are part of the 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA).

The Department of the Army has responded to the EPA's requirements by initiating a Used Solvent Elimination (USE) program. The Army's goal is to reduce the disposal of all hazardous wastes to 50% of the 1985 level by 1992.

Starting in Fiscal Year 90, Army installations will have to pay for hazardous waste disposal from their own funds. In FY 92, installations will be able to bill tenant activities to recoup disposal costs. This policy gives health care facilities an additional economic incentive to minimize the generation of hazardous waste.

HOW TO USE THIS GUIDE

This guide contains questions a commander should ask himself and his subordinates about four areas of his HAZMIN Program. These areas are:

1. Hazardous Waste Management Responsibilities.
2. The Hazardous Waste Inventory.
3. Management Practices for HAZMIN.
4. Technical Improvements for HAZMIN.

Each section discusses answers to these questions. The guide provides suggestions for beginning and improving the health care facility's HAZMIN Program.

HAZARDOUS WASTE MANAGEMENT RESPONSIBILITIES

Question 1. WHO IS THE HEALTH CARE FACILITY'S HAZARDOUS WASTE MANAGER?

To have a successful HAZMIN program, a health care facility must first have an overall hazardous waste management program. A single person must be responsible for overseeing and coordinating this program. That person is the HCF's Hazardous Waste Manager.

The Hazardous Waste Manager should report directly to the Commander. He should have sufficient rank and authority to interface with both MEDDAC and installation officials. He should represent the health care facility on the Installation Hazardous Waste Management Board. The Hazardous Waste Manager should also have authority to oversee or operate hazardous waste management programs at supported activities.

Suggestion:

One of the best choices for Hazardous Waste Manager is the Chief of Logistics. Most of the regulatory requirements concern storage and movement of hazardous waste. The Chief of Logistics must deal with these functions, along with procurement of hazardous materials, as part of his everyday job.

As an alternative, the Chief of Preventive Medicine can act as the Hazardous Waste Manager. The environmental science officers in the PM division usually have a background in hazardous waste regulations. This background will help in formulating the hospital's hazardous waste management program.

Question 2: DOES THE HEALTH CARE FACILITY HAVE A WRITTEN HAZARDOUS WASTE MANAGEMENT SOP?

The answer to this question should be Yes. Without a written SOP, no one is sure which organizations and individuals are responsible for producing, handling, or disposing of hazardous waste. Everyone's time is spent responding to crises, or "putting out fires."

In addition, the hazardous waste management SOP provides valuable continuity through changes in command and personnel. To reflect changes in operations, the SOP should be updated regularly. The SOP should include HAZMIN goals, plans, and responsibilities.

Below is an outline for a health care facility hazardous waste management SOP

HEALTH CARE **FACILITY** HAZARDOUS WASTE MANAGEMENT SOP

1. PURPOSE
2. RESPONSIBILITIES
 - Hazardous Waste Manager
 - Individual & Organization Duties
3. HAZARDOUS WASTE INVENTORY
 - . Description of generating activities
 - . Types and Quantities of hazardous waste generated
4. WASTE ANALYSIS PLAN
 - Procedures for proper identification at point of generation
 - Mechanism (in-house, MEDDAC contract, installation contract, etc) for analyzing unknown wastes
5. HAZARDOUS WASTE ACCUMULATION/STORAGE
 - . Authorized accumulation points at site of generation
 - Instructions for compatible storage
 - . Detailed description of labeling procedures
 - . Description, location of centralized (<90 day) accumulation points
6. TURN-IN PROCEDURES
 - . Instructions, responsibilities for filling out 1348's
 - Points of contact for turn-in (should be a limited number of people to control inventory and access to accumulation points)
 - . Schedule for turn-in to centralized accumulation points
7. EMERGENCY PROCEDURES
 - . Names and phone numbers of people to contact
 - . Preliminary steps to contain spills before help arrives
8. TRAINING
 - . Specific requirements for waste handlers, generators, and supervisors
 - . Schedule for initial training and annual refresher courses
9. **HAZMIN**
 - . Numerical goals and specific methods for waste reduction

Question 3. WHO SHOULD BE INVOLVED WITH HAZARDOUS WASTE MANAGEMENT?

Answer: 1. Waste generating activities.

2. Organizations responsible for handling and disposing of hazardous waste and hazardous materials.

3. Activities with advisory or oversight responsibility.

As a minimum these organizations include logistics, preventive medicine, housekeeping, pharmacy, pathology and other labs, radiology, oncology, dental activities, and veterinary activities. Additional organizations may be identified during the hazardous waste inventory.

The hazardous waste management SOP should specify the duties and responsibilities of these activities. People working in these areas must receive adequate training in identifying, handling, and disposal of hazardous waste.

THE HAZARDOUS WASTE INVENTORY

To establish a baseline for minimizing hazardous waste, the health care facility must conduct a hazardous waste inventory. In performing the inventory, the commander or his delegate must ask where, what, how much, and why hazardous waste is generated.

Question 4: WHERE IS HAZARDOUS WASTE GENERATED AT THE HEALTH CARE FACILITY?

Question 5: WHAT KINDS OF HAZARDOUS WASTE ARE GENERATED AT THESE LOCATIONS?

Question 6: HOW MUCH OF EACH **TYPE** OF HAZARDOUS WASTE IS GENERATED?

Question 7: WHAT IS THE REASON FOR GENERATING EACH TYPE OF HAZARDOUS WASTE?

Another consideration in finding cost-effective HAZMIN options is:

Question 8: **HOW** MUCH DOES IT COST TO DISPOSE OF EACH **TYPE** OF WASTE?

The following activities often generate hazardous wastes:

- Laboratory Research and Analysis.



- Incineration of Infectious and Pathological Waste.



- Degreasing Equipment and Automotive Parts.



The table below is an inventory of hazardous waste typically found at health care facilities. An actual inventory would show how many kilograms of each type of hazardous waste are produced per year. If waste generation varies from month to month, the variation should be indicated.

Discovering the reason different types of hazardous waste are generated is essential to waste minimization. The answer to the question "Why?" is the key to identifying alternatives for waste reduction. Accurate information on disposal costs is necessary for determining the economic benefit of HAZMIN options.

HAZARDOUS WASTE INVENTORY ELEMENTS			
<u>Generating Activity</u>	<u>Waste Type</u>	<u>Quantity (kg/yr)</u>	<u>Reason</u>
Pharmacy	Expired Pharmaceuticals	Varies	Overstock, Professional judgement, Destroy orders from USAMMA
	Damaged items	Varies	Poor handling of hazardous materials
	Prescription leftovers	Varies	Outdated policy, lack of communication
Logistics	Broken containers of hazardous materials	Varies	Improper storage, shipping accidents
	Turn-ins from TO&E units	Varies	Overstock
	Expired shelf-life stock	Varies	Overstock, USAMMA destroy orders
	Precious metals (silver)	Varies	Other HAZMIN efforts
	Solvents, PCBs, etc.	Varies	Medical equipment repair Degreasing at Motor Pool
	Medical Waste Incinerator Ash (in many cases)	Varies	Incineration concentrates toxic heavy metals in ash
Laboratories	Xylene	Varies	Tissue fixing
	Solvents	Varies	Cleaning glassware, cold temperature baths
	Reagents	Varies	Excess from analytical, synthetic reactions
	Spill residues (Mercury, chromic acid, etc.)	Varies	Accidents

MANAGEMENT PRACTICES FOR HAZMIN

Several HAZMIN techniques do not require significant capital investments. They do, however, require training and proactive management. These HAZMIN management practices are: waste identification, waste segregation, safe storage and handling, and employee awareness.

Once the hazardous waste inventory is complete, the commander should ask:

Question 9: HAS ALL HAZARDOUS WASTE BEEN PROPERLY IDENTIFIED?

The EPA's Standards for Hazardous Waste Generators" require all generators to accurately identify their hazardous waste. This requirement exists to prevent dangerous wastes from causing harm to unsuspecting people or the environment. Hazardous wastes must always be labelled and handled as such.

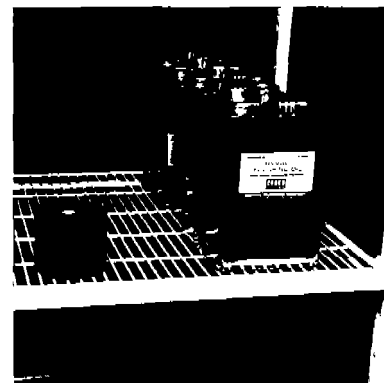
On the other hand, generators should also make sure they do not treat nonhazardous wastes or usable materials as hazardous waste. Doing so results in unnecessary disposal costs and wastes valuable resources.

Here are some example of items commonly mistaken for hazardous waste:

- X-ray Developer (hydroquinone solution). After normal operations, the spent solution can be flushed to the sanitary sewer.
- Cured Epoxy or Urethane Paint. If the paint does not contain lead, chromium, or other toxic heavy metals; the cured paint is nonhazardous
- Empty Containers.
- Unopened Solvents or Reagents. Unless the product has degraded, such potentially usable materials should be turned in to a Defense Reutilization and Marketing Office (DRMO) for reuse, transfer, sale, or donation. ►

For further clarification on the definition and types of hazardous waste, see Title 40 of the Code of Federal Regulations, Part 261, "Identification and Listing of Hazardous Waste." In general, a solid waste is hazardous if it is ignitable, corrosive, reactive, or toxic. Specific wastes listed in 40 CFR 261 are also hazardous.

Consult state or local regulations for definitions more stringent than the federal ones. To obtain requirements for pharmaceuticals and controlled medical items, refer to Supply Bulletin 8-75-87.



Question 10: ARE DIFFERENT WASTE TYPES SEGREGATED FROM EACH OTHER?

Most of the time, segregating waste types reduces disposal costs and increases opportunities for recycling.

For instance, many hospitals generate large quantities of waste xylene. Recycling fairly pure xylene is easier than recycling an even mixture of xylene and another solvent. Accumulating spent xylene separately from other wastes can minimize recycling costs.

If a hospital accumulates a listed hazardous waste in the same containers as a nonhazardous waste, the entire mixture can become hazardous. Such collection practices increase the volume and cost of disposal. Mixing wastes can also lead to inadequate identification and extra analytical costs.

Likewise, disposal of uncontrolled medical items in the same manner as controlled items results in unnecessary expenditures. Uncontrolled items should be collected and disposed of separately.

Segregating wastes also prevents incompatible substances from reacting with each other. Chemicals such as chlorine bleach (calcium hypochlorite) and xylene can react at room temperature to generate fire and toxic gases. Waste accumulation points should have space or physical barriers to prevent incompatible materials from coming in contact if spilled.

In contrast, it is more cost-effective to combine some waste types than to segregate them. Hospitals use ethanol and isopropanol in small quantities. Disposing of these items in containers smaller than one gallon costs about four times more than disposing of larger containers. In this case, combining these similar wastes reduces disposal costs.

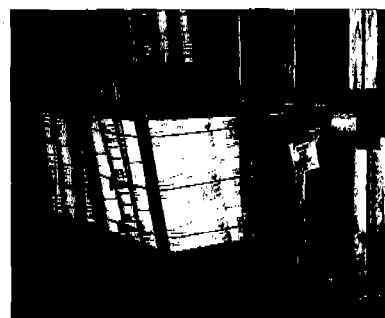
In general, waste segregation ensures safety and reduces the costs of analysis and disposal.

Question 11: **DO WE HANDLE HAZARDOUS MATERIALS AND WASTES SAFELY?**

It makes no sense to generate hazardous waste as a result of frequent spill cleanups. Not only is the health care facility generating waste; it's losing product.

To avoid spills, cartons should not be stacked too high. Warehouses should stack cartons on pallet racks to make the best use of space. Also, laboratories should not overload their shelves with bottles. Labs should store breakable containers of hazardous materials on low shelves in cabinets.

In all cases, incompatible materials must be stored separately to prevent fires, explosions, or toxic gas evolution in case a spill does occur.



Question 12: **DO WE PROCURE ONLY THOSE HAZARDOUS MATERIALS WE NEED AND USE QUICKLY?**

Much of the hazardous waste generated at health care facilities is the result of overstock or expired shelf life. Some of this overstock is necessary to maintain readiness in field units. However, excess pharmaceuticals often expire. Paints kept too long will separate or cure. Ethers and other organics can form dangerous peroxides.

The logistics activity at a hospital should monitor requests for hazardous materials. If such materials are already in stock, they should be issued from stock. Logistics should avoid bulk orders of hazardous materials if only small amounts are required.

Research or patient care may require procurement of unique hazardous materials. Controls on procurement should never obstruct patient care. However, maintaining sensible stock levels will prevent accidents, ensure use before expiration, and help minimize waste generation"



Question 13: **ARE MY EMPLOYEES AND TROOPS AWARE OF REGULATIONS AND THEIR RESPONSIBILITIES FOR HAZARDOUS WASTE MANAGEMENT?**



Employee awareness is a fundamental part of hazardous waste minimization. No one knows laboratory operations better than a lab technician. The people most informed on warehouse activities are the facility operators and their supervisors. If these people know the hospital's HAZMIN program, they can incorporate it and come up with ideas of their own.

The EPA requires training of workers who handle hazardous waste. Occupational Safety and Health Administration (OSHA) rules make sure employees are informed of hazards in the work place. Commanders should couple such training with incentives that encourage suggestions for waste reduction.

TECHNICAL IMPROVEMENTS FOR HAZMIN

In addition to HAZMIN management practices, process changes can reduce hazardous waste generation and disposal. These process changes include material substitution and recycling. Specific process modifications often result from technology transfer among or within health care facilities.

A commander should ask the following:

Question 14: CAN WE SUBSTITUTE NONHAZARDOUS OR LESS HAZARDOUS MATERIALS IN PROCESSES THAT GENERATE HAZARDOUS WASTE?

An example of material substitution at hospitals is replacement of xylene with Histoclear™ in histology labs. Histoclear is a nonhazardous, water-soluble tissue clearing agent. Flushing small doses of this compound to the sanitary sewer can eliminate the waste xylene stream.

Another example is substitution of acetone for methylene chloride for cleaning glassware in chemistry labs. Waste acetone is still hazardous because of its ignitability. It is not, however, a carcinogen like methylene chloride.

Question 15: IS IT FEASIBLE TO RECYCLE ANY OF OUR HAZARDOUS WASTES?

The answer to this question depends both on the type and size of each waste stream. Wastes with recycle potential include:

- . Xylene. Since waste xylene from histology labs is fairly pure, recovery can be cost-effective. Army hospitals have built bench-scale stills from standard glassware. Other health care facilities have purchased five gallon per shift stills to recover larger quantities. The purity of the distillate depends on the ratio of still size to throughput, the operating temperature, and the pressure. ►



- . Degreasing and Cleaning Solvents. Many installations use off-post contractors to recycle spent cleaning solvents. The contractor provides a cleaning apparatus that circulates the solvent and minimizes exposure to workers. When the solvent outlives its usefulness, the contractor removes it and replaces it with fresh material. ►



- . Waste Photographic Fixer. The fixer solution from X-ray and photographic film processing contains silver halides. The spent fixer is toxic because of its silver concentration. However, if the solution is passed through a silver recovery unit, it can be discharged to the sanitary sewer. When the silver recovery units are filled, they should be turned into the local DRMO as part of the Department of Defense's precious metals recovery program. Silver recovery is a mandatory program.
- . Lead-acid Batteries. Health care facilities with motor pools or gas stations can usually exchange spent lead-acid batteries intact when they purchase new batteries. The issuing facility or company will recondition them. The electrolyte should not be drained unless the battery cases are cracked. Neutralization of spent battery electrolyte may be considered hazardous waste treatment and may require a permit.

Army Regulation 420-47, Solid and Hazardous Waste Management, allows installations to keep proceeds from recycling and use them for additional pollution abatement programs, occupational health programs, or morale activities.

Question 16: **WHAT SOURCES ARE AVAILABLE FOR TECHNOLOGY TRANSFER?**

Information on specific waste-reducing process changes is available from several sources. These include:

- Wards and labs within the health care facility. If one unit has a good idea, everyone should know about it.
- Other MEDDACs and MEDCENs.
- Civilian hospitals in the community or region.
- Government and private Waste Exchange Services. The services match waste generators with recycling companies in a classified ad format. An example is the Northeast Industrial Waste Exchange in Syracuse, NY. This exchange serves organizations primarily in New England and the Mid-Atlantic states, but has customers nationwide.
- The US Army Environmental Hygiene Agency (USAEHA). To obtain HAZMIN information, call the Waste Disposal Engineering Division at (301) 671-3651 or AUTOVON 584-3651.
- The US Environmental Protection Agency (EPA) Office of Solid Waste. This office publishes a Directory of Commercial Hazardous Waste Management Facilities that contains information on facilities with recycling processes.

SUMMARY

To reduce hazardous waste generation and disposal, a health care facility must have an active and dynamic hazardous waste management program. The facility's waste inventory must be updated regularly to maintain accuracy. With this inventory, a health care facility can employ management practices and process changes to minimize each hazardous waste stream.

ABOUT AEHA

The U.S. Army Environmental Hygiene Agency is part of the Health Services Command. It provides advice and assistance in the following areas:

- Environmental Quality and Management
- Entomological Sciences
- Radiation and Health Physics
- Occupational Health
- Industrial Hygiene and Hazard Management
- Sanitation and Hygiene
- Laboratory Analysis

To help with general environmental and health needs, AEHA has direct support activities at Fort Meade, Fort McPherson, and Fitzsimmons Army Medical Center. The main agency at Aberdeen Proving Ground performs larger consultations and specialized work.

Any official representative can request AEHA's services. Since AEHA is mission funded, these services are free to Army installations. Projects with unusually large scopes or short time constraints may be conducted on a reimbursable basis.

